[1079] Where the term "comprising" is used in the present description and claims, it does not exclude other elements or steps. Where an indefinite or definite article is used when referring to a singular noun, e.g., "a," "an," or "the," this includes a plural of that noun unless something otherwise is specifically stated. Hence, the term "comprising" should not be interpreted as being restricted to the items listed thereafter; it does not exclude other elements or steps, and so the scope of the expression "a device comprising items A and B" should not be limited to devices consisting only of components A and B. This expression signifies that, with respect to the present disclosure, the only relevant components of the device are A and B.

[1080] Furthermore, the terms "first," "second," "third," and the like, whether used in the description or in the claims, are provided for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances (unless clearly disclosed otherwise) and that the embodiments of the disclosure described herein are capable of operation in other sequences and/or arrangements than are described or illustrated herein.

What is claimed is:

1. A peristaltic pump, comprising:

a cam shaft including a plunger cam;

a plunger-cam follower configured to engage the plunger cam of the cam shaft;

a tube receiver configured to receive a tube;

a spring configured to provide a bias;

a plunger biased toward the tube receiver by the spring, the plunger coupled to the plunger-cam follower, wherein expansion of the plunger cam along a radial angle intersecting the plunger-cam follower as the cam shaft rotates actuates the plunger away from the tube receiver;

a position sensor configured to determine a position of the plunger; and

a processor coupled to the position sensor, wherein the processor is configured to estimate fluid flow within the tube utilizing the position of the plunger.

2. The peristaltic pump according to claim **1**, further comprising an angle sensor operatively coupled to the cam shaft configured to determine an angle of rotation of the cam shaft.

3. The peristaltic pump according to claim **1**, wherein the processor compares a first static region of the position sensor to a second static region of the position sensor to estimate the fluid flow.

4. The peristaltic pump according to claim **3**, wherein the processor determines the first static region by identifying the first static region within a predetermined range of angles as indicated by an angle sensor.

5. The peristaltic pump according to claim **4**, wherein the processor determines the second static region by identifying the second static region within a second predetermined range of angles as indicated by the angle sensor.

6. The peristaltic pump according to claim **4**, wherein the processor determines the first static region and the second static region by measuring the position of the plunger as determined by the position sensor at predetermined angles as indicated by the angle sensor.

7. The peristaltic pump according to claim **1**, wherein the processor compares a first static region measured by the position sensor to a second static region measured by the position sensor to estimate the fluid flow.

8. The peristaltic pump according to claim **6**, wherein the processor determines the first static region by identifying a peak movement of the plunger as measured by the position sensor and identifies the second static region to be after the identified peak movement.

9. The peristaltic pump according to claim **6**, wherein the processor determines the second static region by identifying an end of the first static region.

10. The peristaltic pump according to claim **1**, further comprising an electric motor operatively coupled to the cam shaft to apply a rotational torque to the cam shaft.

11. A peristaltic pump, comprising:

a motor;

a cam shaft operatively coupled to the motor such that rotation of the motor rotates the cam shaft;

a plunger cam coupled to the cam shaft for rotation therewith;

a pivot shaft;

a plunger pivotally coupled to the pivot shaft, the plunger having a cam follower configured to engage the plunger cam of the cam shaft, wherein the plunger is configured to pivot to a first position to compress a tube and to a second position away from the tube;

a bias member configured to bias the plunger to the first position to compress the tube;

a position sensor configured to measure a position of the plunger; and

a processor configured to estimate a volume of fluid discharged from the tube when the bias member causes the plunger to move towards the first position,

wherein:

the plunger and the plunger cam are configured to compress the tube using only a force of the bias member,

the plunger cam is configured to only retract the plunger to the second position, and

the plunger is configured to engage the plunger cam such that the plunger cam does not force the plunger against the tube.

12. A method of pumping fluid, the method comprising:

engaging a plunger-cam follower with a plunger cam;

biasing a plunger toward a tube, the plunger coupled to the plunger-cam follower;

expanding the plunger cam along a radial angle intersecting the plunger-cam follower caused by rotation of the plunger cam thereby actuating the plunger away from the tube;

determining a position of the plunger; and

estimating fluid flow within the tube using the determined position of the plunger.

13. The method according to claim **12**, further comprising determining an angle of rotation of a cam shaft.

14. The method according to claim **12**, further comprising:

comparing a first static region of the plunger position to a second static region of the plunger position; and

estimating the fluid flow in accordance with the first static region and the second static region.

15. The method according to claim **14**, wherein the act of determining the first static region includes identifying the first static region within a predetermined range of angles as indicated by an angle sensor.